MPR 8040.2
REVISION C
EFFECTIVE DATE: October 28, 2004
EXPIRATION DATE: October 28, 2009

MARSHALL PROCEDURAL REQUIREMENTS

ED01

PRODUCT IDENTIFICATION AND TRACEABILITY

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		5/14/99	Document converted from MSFC-P08.1 to a Directive. Previous history retained in system as part of canceled or superseded ISO Document files.
Revision	A	8/16/99	Changes made to reflect new MSFC reorganization.
Revision	B	7/10/00	Changed OPR to ED01. P.1: Changed to read: "This Marshall Procedures and Guidelines (MPG) provides for the definition of identification requirements for in-house produced or procured configuration items, parts, material, and software while under MSFC's control (i.e., manufacturing, delivery, operations, storage, etc.). This procedure implements the requirements of MPD 1280.1, "Marshall Management Manual." P.2: Changed to read: "This MPG applies to all MSFC organizational elements involved in the design, procurement, fabrication, inspection, test, and operation of hardware/software for MSFC projects. It shall be used for MSFC developed flight hardware, flight software, and flight-associated ground support equipment products. Identification, if required, for non-flight items controlled by MPG 8060.2 and facility items controlled by MPG 8823.1 shall be jointly decided by the design control process owner and the program/project manager/customer/user." P.4: Deleted paragraph a.& renumbered paragraphs. P.5: Added MPG 8060.2 & MPG 8823.1. 1.1 Changed 2nd sentence to read: "Product includes hardware, software, data, processed material, or a combination thereof." 1.3: Replaced 1.3 and added 1.4 and 1.5 with two additional definitions. 2.1: Replaced last sentence with: "Design organizations will ensure that appropriate product identification is annotated in the design documentation. Documentation defining requirements for items requiring serialization or other unique identification will contain instruction for the application of the required product identification." 2.4: Added paragraph. 2.3 & 3.1 First sentence: Deleted "unique." 3.1,3.3, & 3.4: Replaced "reference" with "see." 3.2: Added Manufacturing Organization and renumbered paragraphs thereafter. Flow Chart: Added paragraph 3.2. 4. Changed to read: "Product Identification is documented as required by the records generated in MPG 8040.3." 5. Flow Diagram: Deleted "received at MSFC" from block 3.1. Added 3.2 & reworded 3.3 and 3.4. [Footer URL updated 01/14/2004 by Directives Manager.]
Revision	C	10/28/2004	Updated font, ensured "shall" language was utilized for requirements, incorporated the content of MPG 8040.3 "Product Traceability" and MWI 8040.4 "Application Guidance for Traceability" into this MPR. Added definitions and integrated responsibilities from MPG 8040.3 and MWI 8040.4. Added clearer product identification requirements (part and software identification, serial numbering, lot numbering) and traceability requirements to the Project Manager procedural responsibilities. Placed the Material Traceability Levels from MWI 8040.2 into Appendix A. Placed guidance from MWI 8040.4 on serial numbering and lot numbering criteria and guidance on drawing notes for product identification and traceability into Appendix Z Guidance.

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PREFACE

P.1 PURPOSE

This Marshall Procedural Requirements (MPR) provides product identification and traceability requirements for in-house produced or procured configuration items, parts, material, and software while under Marshall Space Flight Center's (MSFC's) control (i.e., receiving, manufacturing, test, delivery, operations, storage, etc.). This procedure implements the requirements of MPD 1280.1, "Marshall Management Manual."

P.2 APPLICABILITY

This MPR applies to all MSFC organizational elements involved in the design, procurement, fabrication, inspection, test, and operation of hardware/software for MSFC projects. It shall be used for MSFC-developed flight hardware, flight software, and flight-associated ground support equipment products. Identification and traceability for non-flight items controlled by MPR 8060.2 and facility items controlled by MPR 8823.1 shall be jointly determined by the design control process owner and the program/project manager/customer/user.

P.3 AUTHORITY

MPD 1280.1, "Marshall Management Manual"

P.4 APPLICABLE DOCUMENTS

a. MPR 1440.2, "MSFC Records Management Program"

b. MSFC-STD-555, "MSFC Engineering Documentation Standard"

c. MSFC-STD-3012, "EEE Parts Management and Control for MSFC Space Flight Hardware"

d. MSFC-STD-3394, "Standard for Contractor Configuration Management for MSFC Programs/Projects"

e. NPR 1441.1, "NASA Records Retention Schedules" (NRRS)

P.5 REFERENCES

a. MPR 6410.1, "Handling, Storage, Packaging, Preservation, and Delivery"

b. MPR 8060.2, "Non-Flight and Non-Facility Design and Development"

c. MPR 8730.1, "Inspection and Testing"

d. MPR 8823.1, “Design Control of Facilities”

e. MSFC-STD-2806, “MSFC Tailoring Standard for the Global Drawing Requirements Manual”

P.6 CANCELLATION

MPG 8040.2B, MPG 8040.3A, and MWI 8040.4B dated July 10, 2000

Original signed by
Robin N. Henderson for

David A. King
Director

DOCUMENT CONTENT

1. DEFINITIONS

1.1 Actual (Chemical and Physical Analysis). Material test reports that certify and document that actual chemical and physical attributes meet the raw material specification. This includes specific percentages of each chemical element and physical tensile strength results for each lot/batch.

1.2 Article. A unit of hardware or software or any portion thereof required by the contract.

1.3 Assembly. A number of parts or subassemblies or any combination thereof joined together to perform a specific function.

1.4 Certificate of Conformance (COC). A contractor's written statement certifying that supplies or services comply with contract requirements. The certificate of conformance may be used instead of source inspection at the discretion of the Contracting Officer (CO).

1.5 Component. A combination of parts, devices, and structures, usually self-contained, which performs a distinctive function in the operation of the overall equipment; e.g., a “black-box,” transmitter, encoder, or cryogenic pump.

1.6 Configuration Item (CI). An aggregate of hardware, firmware, software, or any of its discrete portions, which satisfies an end-use function and is designated for CM. CI’s may vary widely in complexity, size, and type.

1.7 Date Code. A number which indicates a specific date in code. A date code may consist of a series of numbers that indicate day, week, month, or year.

1.8 Engineering Parts List (EPL). An engineering document that identifies part/parts information including release authority, part/parts numbers, quantities, weights, traceability requirements, and part/parts descriptions required to build the respective assemblies and subassemblies.

1.9 Fracture Critical. A classification which assumes that fracture or failure of the part/component resulting from the occurrence of a defect would result in a catastrophic hazard which could lead to loss of flight vehicle or crew.

1.10 Identification Decal. A decal which may be used as necessary to record product and configuration identification information when actual size, shape, and/or material properties do not permit direct marking of the product. The decal is applied to the package containing the product.

1.11 Identification Number. Number assigned and attached (when feasible) to hardware/software used in maintaining traceability. It can consist of a serial number, trace number, lot number, or date code that is paired with the appropriate manufacturer's name or symbol, or the designer part identification numbers.

1.12 Lot Number. A unique number assigned to identify a group of identical parts that are produced concurrently by a common process. Lot number requirements apply to procured and in-house manufactured parts (lot number assigned by the Configuration Management Release Desk for in-house only).

1.13 Material Traceability Levels. A numerical code ranging from 1 to 4, used to identify material traceability requirements on Engineering Parts Lists. It identifies traceability requirements for individual parts, assemblies, or subassemblies.

1.14 Mill Markings. Physical item identification markings applied to raw materials in accordance with Federal Standards issued pursuant to the Federal Property and Administrative Services Act of 1949, as amended (i.e., for nickel and nickel-base alloys, Federal Standard No. 182B applies; for aluminum, magnesium and titanium, Federal Standard No. 184B applies).

1.15 Part. One piece or two or more pieces joined together, which are not normally subject to disassembly without destruction.

1.16 Parts Tag MSFC Form 312. The Parts Tag is a quality control document that remains with the part, and records parts identification and inspection verification during manufacture, test, assembly, and storage.

1.17 Product. The result of activities and/or processes. Product includes hardware, software, data, processed material, or a combination thereof.

1.18 Product Identification (PI). A method used to distinguish between products or like products (in form, fit, or function). Consists of a unique part number (P/N).

1.19 Serial Number. A permanent number assigned to selected hardware/software which, in conjunction with the part number, permits isolation of the item and facilities hardware/software allocations, traceability, accountability, location determination, and identifies design effectivity. Serial numbers are assigned by the Configuration Management Release Desk.

1.20 Traceability. The ability to trace the history, application, or location of a product, part, or material by means of recorded identifications, from the first stage of use to end item use, and the reverse.

1.21 Trace Number. A number assigned to raw material for identification prior to fabrication and subsequent lot or serial number assignment.

1.22 Typical (Chemical and Physical Analysis). Material test reports that certify the chemical and physical attributes of a raw material fall within the specified range as denoted in the material specification for each lot/batch.

2. RESPONSIBILITIES

2.1 Project Manager. Project manager shall be responsible for developing and documenting technical and quality requirements for MSFC-supplied products which clearly define product identification and traceability requirements.

2.2 System Engineer. Shall assist project manager in defining policy and procedure requirements for product identification and traceability and shall ensure implementation of these requirements.

2.3 Design Organizations. Design organizations shall be responsible for implementing product identification in accordance with MSFC-STD-555 and Program/Project Documentation. Design organizations shall specify traceability requirements on the lowest-level drawing and engineering parts list per MSFC drawing standard requirements (MSFC-STD-555). Design organizations shall ensure that product identification is annotated in the design documentation. Documentation defining requirements for items requiring serialization or other unique identification shall contain instruction for the application of the required product identification.

2.4 Hardware Handling Directorates. Hardware handling directorates shall implement identification and traceability requirements when hardware is in their control.

2.5 Safety and Mission Assurance (S&MA) Designated Representative. When product identification requirements and traceability are specified in the contract or program plan, the S&MA designated representative shall ensure these requirements are specified to the appropriate quality assurance organizations.

2.6 Manufacturing Organizations. Manufacturing organizations shall apply product identification and traceability to products in accordance with the engineering documentation.

3. PROCEDURE

Actionee		Action
Project Manager	3.1	The project manager shall define product identification and traceability requirements for their project and ensure the requirements are documented. Appendix Z contains guidance on typical project documentation which address product identification and traceability. The contract shall contain product identification and traceability

requirements for procured configuration items. MSFC-STD-3394 is recommended to be utilized for contract product identification requirements.

Product identification and traceability for in-house items or items procured to MSFC design shall meet the requirements of this MPR.

3.1.1 Part Identification Numbers and Software Identifiers: A unique Part Identification Number (PIN) shall be assigned to each MSFC-designed product in accordance with MSFC-STD-555. Part interchangeability and re-identification shall be in accordance with MSFC-STD-555. Re-identification of non-interchangeable parts and use of the unique PIN shall ensure that the product identifier provides direct traceability to each item's configuration definition. A unique software identifier shall be assigned to MSFC-produced software in accordance with MSFC-STD-555.

3.1.2 Serial Numbers: Serial numbers shall be assigned to all complete units of a Configuration Item (CI) and to critical parts and components when traceability is necessary. Appendix Z provides guidance on application of serialization requirements. Serial numbers shall be permanently assigned in consecutive and non-duplicating numerical sequence for a particular part number and shall not be changed even though the component, assembly, or part has been identified by a new part number. Serial numbers shall be assigned in accordance with MSFC-STD-555.

3.1.3 Lot Numbers: Lot numbers shall be assigned for non-serialized items that require traceability where all items have been fabricated from a particular batch of material, have undergone a particular process, or have been manufactured/tested in a group with each item in the group having an identical history. Appendix Z provides guidance on application of lot numbering requirements. Lot numbers shall be assigned in accordance with MSFC-STD-555.

3.1.4 Product Traceability: Traceability requirements shall be determined for each program/project. Material traceability levels in Appendix A shall be selected and the associated requirements applied. Specific traceability requirements for EEE parts may be in accordance with MSFC-STD-3012.

		Emphasis shall be placed on consequences of hardware failure over payload classification when determining material traceability levels. Applicable traceability levels shall be specified on configuration documentation. 3.1.4.1 Exempted Equipment: Prototype equipment used in-house for engineering evaluation only (at the discretion of the systems engineer), manufacturing tooling, transportation, and facility-type equipment shall not require maintenance of traceability.
Systems Engineer	3.2	Shall assist program/project manager in defining policy and procedure requirements for product identification and traceability and shall ensure implementation of these requirements.
MSFC Personnel	3.3	MSFC personnel shall obtain serial numbers for in-house items or items procured to MSFC design from the MSFC Release Desk in accordance with MSFC-STD-555.
Design Organizations	3.4	Design organizations shall specify product identification and traceability in design documentation (material traceability levels per Appendix A). Design engineers shall recommend traceability levels to the program/project. If traceability is required, the design organization shall specify serialization or lot numbering on the design documentation for the hardware and the hardware's next higher assemblies. Appendix Z provides guidance on hardware requiring serialization or lot numbering. Figure 2 in Appendix Z provides guidance on specifying identification and traceability requirements on engineering drawings. The developing software organization shall establish and control traceability requirements for software end items.
Hardware Handling Directorates	3.5	Hardware handling personnel shall maintain product identification and traceability for the hardware during their control. (Reference MPR 6410.1.)

Manufacturing Organizations	3.6	Manufacturing shall apply and maintain product identification and traceability numbers to items. Product identification numbers shall be applied to items as specified on the engineering drawings.
S&MA	3.7	Quality Assurance shall verify and record product identification and traceability documentation for hardware and software received or manufactured at MSFC. (Reference MPR 8730.1.)

4. RECORDS

Product identification and traceability records shall be identified in the program/project records plan and maintained in accordance with NPR 1441.1, Schedules 7 and 8 and MPR 1440.2. MSFC Release Desk records are identified in MSFC-STD-555.

5. FLOW DIAGRAM

See Figure 1.

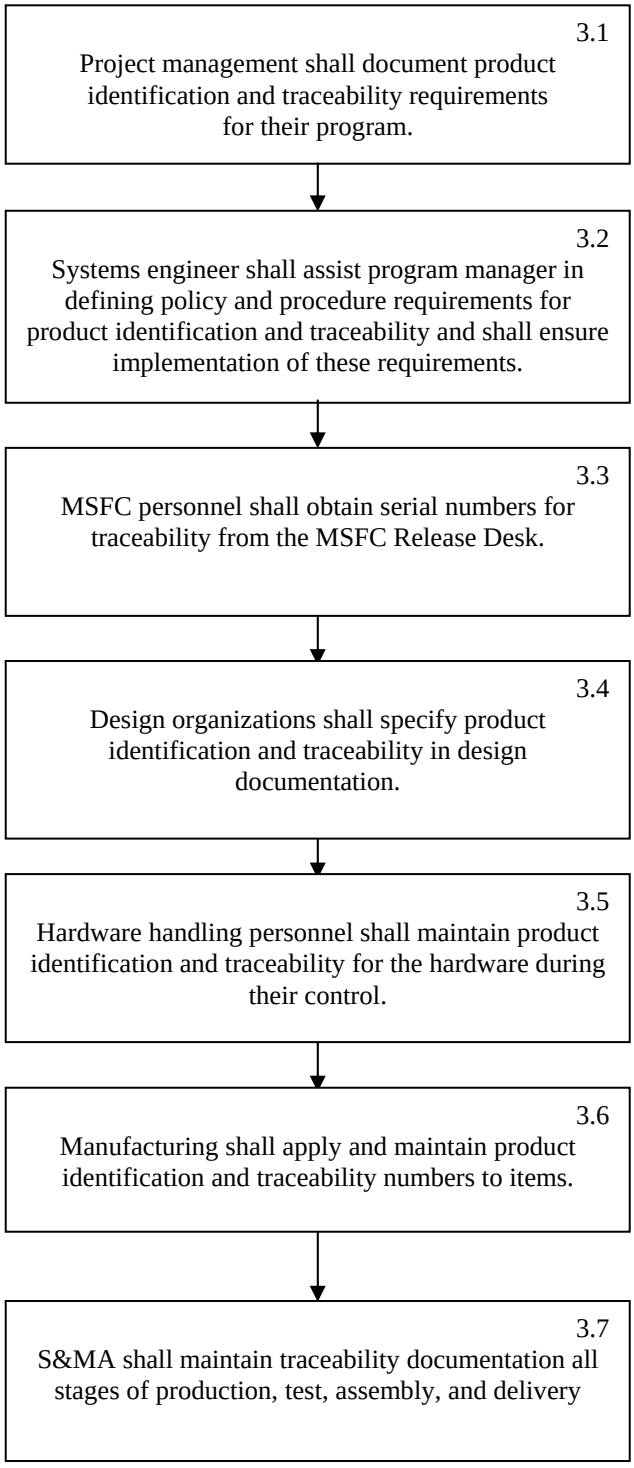


Figure 1. Product Identification and Traceability Flow

Appendix A. Material Traceability Level Requirements

A.1 Level 1: Shall require (a) records containing actual chemical and physical material verification test results, (b) Certificates of Conformance (COCs), (c) detailed process, inspection, and discrepancy records traceable to the material from which fabrication originated, and (d) in-house chemical and physical verification testing.

Level 1 material traceability requirements shall be applied for hardware whose failure could result in loss of life, overall mission, Class A/B payload, or "launch vehicle." Level 1 material traceability requirements provide the highest degree of traceability confidence by requiring in-house chemical and physical verification testing in addition to other stringent traceability documentation requirements.

A.2 Level 2: Shall require (a) records containing actual chemical and physical material verification test results, (b) COCs, and (c) detailed process, inspection, and discrepancy records traceable to the material from which fabrication originated.

Level 2 material traceability requirements shall be applied for hardware whose failure could result in loss of life, overall mission, Class A/B payload or launch vehicle (the same class of hardware as level 1), and for which in-house testing is not justified. Level 2 traceability requirements provide a high degree of material traceability confidence without the added cost of in-house chemical and physical verification testing.

A.3 Level 3: Shall require (a) COCs and (b) limited in-house chemical and physical verification testing or typical chemical and physical material verification test results. In-house chemical and physical testing, as determined by the design organization, shall be used to ensure that material is in compliance with material/drawing specifications in the event that a COC is unavailable.

Level 3 material traceability requirements shall be applied for hardware whose failure would not result in loss of life, overall mission, Class A/B payload or launch vehicle (i.e., hardware within a Class C/D payload whose failure affects only that C/D payload). Limited in-house testing on test specimens (i.e., hardness testing, conductivity testing, portable mass spectrometry testing) is appropriate at this level of traceability.

A.4 Level 4: Shall require a COC, mill marking, or trace number.

Level 4 material traceability requirements shall be applied for hardware for which it is not feasible or not deemed necessary to require detailed raw material traceability (i.e., computer chips traceable by lot number/or date code only; raw material traceability is limited to mill markings, etc.) and whose failure would not result in loss of life, overall mission, Class A/B payload, or launch vehicle. Level 4 material traceability is also appropriate for use in addressing traceability for commercial parts and off-the-shelf hardware for which no formal traceability exists.

Appendix Z. Guidance

Program/Project Documentation Defining Product Identification and Traceability. Product identification requirements are typically identified in the Configuration Management (CM) Plan. The Fracture Control Plan, EEE Parts Control Plan, Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL), and Limited Life Items List should contain information which aids the project in identifying the parts which require traceability, and therefore require serialization and lot numbering.

Z.1 Serialization. The following types of equipment/hardware and their next higher assemblies typically require traceability and should be considered for serialization:

Z.1.1 Electro-mechanical, Electrical, Electronic (EEE), and mechanical assemblies and subassemblies which are replaceable or repairable such as valves, actuators, pressure vessels, batteries, telemetry multiplexers, amplifiers, transducers, modules, printed circuit boards, etc.

Z.1.2 Structural items having critical design significance which are controlled and for which test and inspection records are required and maintained (e.g., fracture-critical parts, pressure vessel assemblies, forgings, castings, extrusions, etc.).

Z.1.3 Articles or assemblies subject to time-cycle variation limitations, periodic checkout, calibration, servicing and maintenance, and re-inspection.

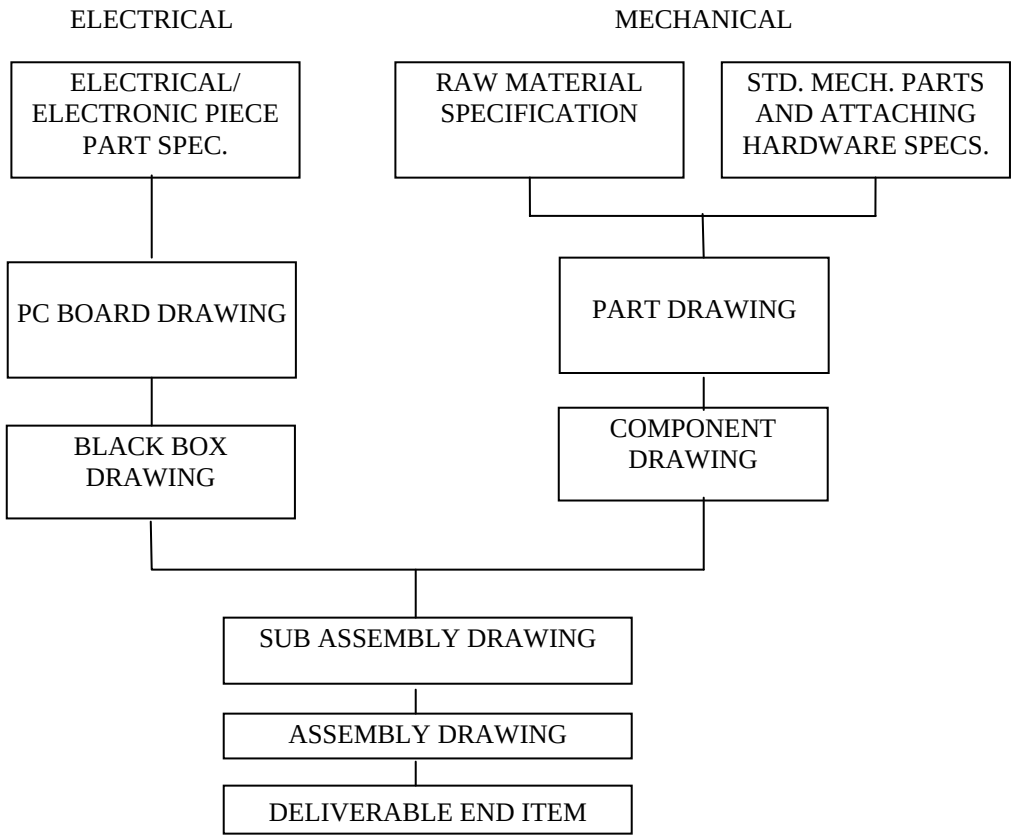
Z.1.4 Articles requiring selective fits for matched sets of functional assemblies.

Z.2 Lot Number and/or Date Codes. The following types of equipment/hardware typically require traceability and should be considered for assignment of lot number and/or date codes and applicable manufacturer's Commercial and Government Entity (CAGE) Code:

Z.2.1 Electronic parts, such as transistors, resistors, diodes, capacitors, switches, connectors, and relays. Additional traceability requirements for electronic parts are addressed in MSFC-STD-3012.

Z.2.2 Items fabricated from a common lot of raw material, heat, batch, or process, such as non-critical forgings and castings, fittings, or items which are subjected to destructive acceptance sampling such as fasteners and pyrotechnic devices.

Z.2.3 Raw materials such as plastic molding powder and molded parts, electrical potting compounds, paints, greases, adhesives, welding rod or wire, and gasket materials.



The engineering drawings should include traceability identification requirements in the drawing notes (per MSFC-STD-2806). Notes should address the following:

- Serialization, lot/date traceability, and materials traceability as required per MPR 8040.2 and project documentation.
- The Part Identification Number (PIN) to be used in accordance with MSFC-STD-555 (CAGE code/ MFG's name, part number, and associated serial number, lot number, date code, etc).
- The method of applying the Part Identification Numbers (metal stamp, ink stamp, paint, etch, etc.).

Figure 2. Specifying Identification and Traceability Requirements on Engineering Drawings